CLAIMS

What is claimed is:

1. An apparatus comprising:

a first manifold chamber (207);

a first manifold connector (209) having a bore in communication with the first manifold chamber;

a second manifold chamber (208) substantially sealed from the first manifold chamber;

a second manifold connector (210) having a bore in communication with the second manifold chamber; and

a plurality of valve cylinders (210) each having,

a valve bore (202) open at one end thereof,

a first vent (216) connecting the valve bore to the first manifold chamber,

a second vent (217) connecting the valve bore to the second manifold chamber, and

a valve connector (204) having a bore connected to the valve bore.

2. The apparatus of claim 1 further comprising:

a plurality of valve plungers (230) each disposed within a valve bore of a respective one of the valve cylinders.

3. The apparatus of claim 2 wherein the valve plunger comprises:

a shaft;

a first seal (232) coupled to the shaft and forming a substantially sealed coupling to the valve bore;

a second seal (233) coupled to the shaft and forming a substantially sealed coupling to the valve bore;

a portion (231) of the shaft between the first and second seals having a smaller diameter than the valve bore;

the first and second seals being disposed along the shaft a predetermined distance apart which is greater than a distance between the connector bore and one of the first and second vent.

4. The apparatus of claim 1 comprising:

a manifold body (200) in which the first and second manifold chambers are formed; and

a manifold cover (220) coupled to the manifold body to seal the first and second manifold chambers from an external ambient, the manifold cover including a plurality of holes (221) extending through the manifold cover for providing access to the valve connector bores.

5. The apparatus of claim 5 wherein:

the valve connectors extend through the manifold cover; and

the holes through the manifold cover mate with external dimensions of the valve connectors.

6. The apparatus of claim 1 further comprising:

first (225L) and second (225R) substantially identical manifolds coupled together in a substantially "yin and yang" configuration.

7. The apparatus of claim 6 wherein:

the first manifold chamber of the first manifold is coupled to the second manifold chamber of the second manifold, forming a first single large manifold chamber;

the second manifold chamber of the first manifold is coupled to the first manifold chamber of the second manifold, forming a second single large manifold chamber.

8. The apparatus of claim 7 further comprising:

a first T fitting (241) coupling a first manifold connector (209L) of the first manifold to a second manifold connector (210R) of the second manifold.

9. The apparatus of claim 8 further comprising:

a second T fitting (261) coupling a second manifold connector (210L) of the first manifold to a first manifold connector (209R) of the second manifold.

10. The apparatus of claim 9 further comprising:

one of a pressure relief valve (240) and a vacuum relief valve (260) coupled to one of the first and second T fittings.

11. The apparatus of claim 10 further comprising:

the other of a pressure relief valve and a vacuum relief valve coupled to the other of the first and second T fittings.

12. The apparatus of claim 6 further comprising:

a plurality of valve plungers (230) each disposed within a respective one of the valve cylinder bores of the first and second manifolds.

13. The apparatus of claim 12 wherein:

the valve cylinders of the first manifold and the valve cylinders of the second manifold are substantially one half valve cylinder increment offset with respect to each other.

14. The apparatus of claim 6 further comprising:

the first manifold having a first coupler (214L) in communication with its first manifold chamber; and

the second manifold having a second coupler (213R) in communication with its first manifold chamber.

15. The apparatus of claim 14 wherein:

a second coupler (213L) of the first manifold and a first coupler (214R) of the second manifold having been removed after manufacturing of the substantially identical manifolds.

16. The apparatus of claim 15 wherein:

the first coupler of the first manifold and the second coupler of the second manifold having been put into communication with their respective manifold chambers after manufacturing of the substantially identical manifolds.

17. The apparatus of claim 1 wherein:

the first and second manifold chambers are divided by an interior wall (206) including the valve connectors.

18. The apparatus of claim 1 wherein:

the apparatus is formed by injection molding plastic.

19. The apparatus of claim 1 wherein:

the valve cylinders comprise a floor of the apparatus.

20. The apparatus of claim 1 configured for use in controlling pneumatic bladders of a zone climate control HVAC system.

21. A pressure and vacuum manifold assembly comprising:

A) a first manifold (225L) and a second manifold (225R), each including,

1) a first manifold chamber (207),

2) a second manifold chamber (208),

3) a plurality of valve connector cylinders (204) separating the first and second manifold chambers,

4) a plurality of valve cylinders (201) each having,

i) a bore (202),

ii) a first vent (216) connecting the first manifold chamber to the bore,

iii) a second vent (217) connecting the second manifold chamber to the bore, and

iv) a third vent (205) connecting the bore to a corresponding one of the valve connector cylinders,

B) a first manifold connector (241) coupling the first manifold chamber of the first manifold to the second manifold chamber of the second manifold;

C) a second manifold connector (261) coupling the second manifold chamber of the first manifold to the first manifold chamber of the second manifold;

D) a first supply connector (214L) providing flow access to the first manifold chamber of the first manifold, and via the first manifold connector to the second manifold chamber of the second manifold; and

E) a second supply connector (213R) providing flow access to the first manifold chamber of the second manifold, and via the second manifold connector to the second manifold chamber of the first manifold;

whereby pressure can be applied to one of the supply connectors and fed to both manifolds and vacuum can be applied to the other supply connector and fed to both manifolds.

22. The pressure and vacuum manifold assembly of claim 21 further comprising:

a plurality of valve plungers (230) each disposed within a respective one of the valve cylinder bores.

23. The pressure and vacuum manifold assembly of claim 22 wherein the valve plunger comprises:

a shaft (231) extending out an open end of the valve cylinder bore;

a first seal (232) coupled to the shaft at a first position;

a second seal (233) coupled to the shaft at a second position such that when the first seal is located between the first vent and third vent, the second seal is located between the second vent and the open end of the valve cylinder bore.

24. The pressure and vacuum manifold assembly of claim 23 wherein the valve plunger further comprises:

a first actuator surface (234) against which an actuator can push to insert the valve plunger into the valve cylinder bore; and

a second actuator surface (235) against which an actuator can pull to withdraw the valve plunger from the valve cylinder bore.

25. The pressure and vacuum manifold assembly of claim 22 further comprising:

a pressure relief valve (240) coupled to one of the manifold connectors; and

a vacuum relief valve (260) coupled to the other manifold connector.

26. The pressure and vacuum manifold assembly of claim 22 wherein:

the valve plungers of the first manifold and the valve plungers of the second manifold can all be placed in a retracted position without interfering with each other.

27. The pressure and vacuum manifold assembly of claim 21 wherein:

the valve cylinder bores of the first manifold and the valve cylinder bores of the second manifold are oriented toward each other in a middle of the pressure and vacuum manifold assembly.

28. The pressure and vacuum manifold assembly of claim 21 wherein:

the first and second manifolds comprise two substantially identical units of a single manufactured component.

29. The pressure and vacuum manifold assembly of claim 28 wherein:

the single manufactured component includes two supply connectors;

one of the supply connectors is removed from the first manifold to leave the first supply connector; and

the other of the supply connectors is removed from the second manifold to leave the second supply connector.

30. The pressure and vacuum manifold assembly of claim 28 wherein:

each manifold includes a first connector cylinder (209) in communication with its first manifold chamber and a second connector cylinder (210) in communication with its second manifold chamber;

the first manifold connector connects the first connector cylinder of the first manifold to the second connector cylinder of the second manifold; and

the second manifold connector connects the second connector cylinder of the first manifold to the first connector cylinder of the second manifold.

31. A dual chamber manifold comprising:

an exterior wall (203);

a plurality of valve cylinders (201), forming a floor coupled to the exterior wall;

a cover (220) coupled to the exterior wall, whereby a volume is enclosed within a space created by the exterior wall, the floor, and the cover; and

a corresponding plurality of connector cylinders (204) coupled to and substantially perpendicular to the valve cylinders, and coupled to the cover, forming an interior wall dividing the enclosed volume into a first manifold chamber and a second manifold chamber.

32. The dual chamber manifold of claim 31 further comprising:

a plurality of valve plungers disposed within the valve cylinders, each individually operable to selectively couple its respective connector cylinder to each, one at a time, of the first and second manifold chambers.

33. The dual chamber manifold of claim 32 further comprising:

two such dual chamber manifolds coupled together such that one of the first and second manifold chambers of each dual chamber manifold is coupled to one of the first and second manifold chambers of the other dual chamber manifold, and the other of the first and second manifold chambers of each dual chamber manifold is coupled to the other of the first and second manifold chambers of the other dual chamber manifold.

34. The dual chamber manifold of claim 33 wherein:

the two dual chamber manifolds are of substantially identical construction and are coupled together in yin and yang fashion.

35. The dual chamber manifold of claim 34 wherein:

first manifold chamber of the first manifold is coupled to the second chamber manifold of the second manifold, forming a first large manifold;

the second manifold chamber of the first manifold is coupled to the first chamber manifold of the second manifold, forming a second large manifold;

a single common pressure connector feeds the first large manifold; and

a single common vacuum connector feeds the second large manifold.

36. A zone climate control system, for installation in an existing forced air HVAC system in a building, comprising:

1) a plurality of airflow control devices adapted for installation inside air vents in rooms of said building;

2) first means for independently controlling each said airflow control device, said first means mounted on a discharge plenum of said HVAC system such that said first means is

accessible from an inside of said plenum, wherein said first means controls said airflow control devices by selectively providing one of pressurized air and vacuum;

3) second means for connecting each said airflow control device to said first means such that said second means is entirely inside said plenum and said air ducts, and such that said first means controls each said airflow control device through said second means;

whereby said first means, said second means, and each said airflow control device of said control system are installed by accessing only said plenum and said air vents; and

whereby said air ducts are unmodified in any other way;

4) an air pump that provides pressurized air and vacuum;

5) a plurality of independently operable air valves, each air valve including,

a) an alpha means for connecting to said pressurized air,

b) a beta means for connecting to said vacuum, and

c) a valve slide having a pressure position adapted to provide a path from said alpha means to said second means, and a vacuum position adapted to provide a path from said beta means to said second means;

6) a delta means for moving one at a time any one of the valve slides to either said pressure position or said vacuum position, the delta means responsive to valve control signals generated by a controlling processor; and

7) an epsilon means for positioning said delta means such that each of the valve slides can be independently set to said pressure position or said vacuum position, said epsilon means responsive to position control signals generated by said controlling processor;

whereby various combinations of said valve control signals and said position control signals independently cause either said pressurized air or said vacuum to be connected to each of the plurality of said second means for connecting.